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Ripening Pears in Fan Cars During Transit

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Ripening Pears in Fan Cars During Transit

Introduction

The present method of ripening or conditioning winter pears is by placing them in ripening rooms at 65°F and 85 percent humidity until the desired degree of ripeness is reached. This is done either by the wholesaler or the retailer at the terminal market. If the ripening process could be started sometime prior to their arrival from the West Coast, less time would be required to ripen them at the terminal market. Therefore, the objective of this test was to determine the feasibility of ripening western grown winter pears while in transit between Chicago and New York City.

Methods and Procedure

Three cars[1] of Bosc pears were loaded on November 30 at Medford, Oregon for destinations in New York. All fruit was packed out of cold storage where it had been held at 31° since harvest. Four test boxes selected at time of loading as representative of a uniform lot of fruit were placed respectively at bottom, middle and top quarterlength centerline and bottom doorway north side in each car. These were for removal to a 65°F. ripening room at the time of unloading. They had an average pressure test of 11.6 pounds at time of loading. Electric resistance thermometers were placed in 11 positions in the fruit throughout the head end of each car with one thermometer installed near the ceiling at the quarter length to indicate top air temperatures. Ryan thermographs were placed at the ceiling and under the floor rack at this point also. All cars were of indentical construction and were equipped with air circulating fans and wall flues. Each contained 3"-3 1/2" of insulation in the walls and ends and in the roof and floor respectively. All loads were through loads. Boxes were placed on end 3 high, eight rows wide in the car. The cars were moved under Rule 515-C (keep vents closed to destination). No heat was applied to the cars between origin and Chicago.

The movement to Chicago was unaccompanied and it was planned to install heaters in the cars at Hammond, Indiana upon their transfer to the Erie Railroad. However, as two of the cars were made up into a through train prior to arrival at Hammond, they could not be serviced until arrival at Huntington, Indiana, some 120 miles east. Here all of the test cars were assembled and the heaters were installed and lighted just prior to departure at 3:15 a.m. on December 9. Pressure tests of the commercial fruit were made at Huntington. Instrument failure at this point prevented any temperatures being taken en route. Readings were made upon arrival at Jersey City when additional equipment became available. The alcohol heater thermostats were set at the maximum of 60° while the charcoal heater thermostats were set at the top range of 69-74°. Though midget charlets are recommended for the Simplex heater only standard size were available. These burned in a very satisfactory manner.

1/ A fourth car similar in every respect was prepared at the same time for use in a car ripening test at destination in the Bronx. (See "Ripening Pears in Fan Cars at the Terminal Market," A. T. & S. Report No. 222, 1950). This car had no heaters placed in it during transit. It was diverted from the test train at Hornell for delivery to the New Haven at Maybrook and arrived in the Bronx on Monday, December 12, 1949. At that time a top doorway test package was removed for ripening at 65°F., along with all test packages from the other three cars.

The test cars and heaters are listed as follows:

Car No.	Heater & Number	Placement
A PFE 7379	4 Simplex Thermostatic charcoal	2 each bunker
B PFE 7328	4 Preco Thermostatic alcohol	2 each bunker
C PFE 5577	2 Preco Thermostatic alcohol	1 each bunker
D PFE 7451	Mono-check car	

Results

The weather encountered between Chicago and New York was about normal for this time of the year with temperatures ranging from 3° to 38° (Figure 1). Total elapsed time from Huntington to Jersey City was 43.25 hours of which 23.67 hours or 54.7 percent was running time. This is slightly over the usual elapsed time because of arrival on Saturday with no unloading scheduled until the following night. There were two unusually long stops during which the fans were inoperative, one of 4 hours 50 minutes at Marion, Ohio, the other of 7 hours and 20 minutes at Hornell, N. Y.

All heaters operated satisfactorily during the trip. The 4 alcohol heaters in Car B were on pilot for the 1st 3 hours after bottom bunker air temperatures rose to 52° and 50°. The charcoal heater dampers were closed or partially closed after bunker air temperatures at the level of the thermostats reached approximately 56°. The temperature was at that point or above from Marion on (Tables 1 and 2). It is estimated that the four alcohol heaters in Car B were on full burning from 30 to 34 hours and on pilot the balance of the time. The alcohol heaters in Car C were on full burning at all inspections except upon arrival when one was found to be on pilot. The bottom bunker air temperature at this point was 54° (Table 3). It is estimated that both heaters were on full burning for practically the entire trip or about 44 hours. All heaters were lighted just prior to the departure of the train from Huntington, Ind. at 3:15 a.m. on the 9th as it was desired to have the fans in operation as much of the time as possible while the heaters were burning. The alcohol heaters were extinguished at midnight of the 10th shortly after arrival at Jersey City and the charcoal heaters were removed from the bunkers at the same time. They were removed because the fuel remaining in the fire pot normally continues to burn and produce heat for several hours after closing the fuel cut-off slide. The alcohol heaters burned an average of 3.9 gals. per heater for the trip. The charcoal heaters each burned approximately 30 pounds of charlets. One filling of the heaters (both types) was therefore sufficient for the run from Chicago to Jersey City. The cars were unloaded at Pier 20 in New York on Sunday night for the auction Monday morning. The commercial loads arrived in satisfactory condition.

Fruit temperatures at loading averaged around 34° and warmed up to about 40° by the time the heaters were installed at Huntington. Although the resistance thermometers could not be read at this point, a number of temperatures were taken in each car by means of dial fruit thermometers and are as shown in Table 4. A similar check of fruit temperature at the doorway was made at Hornell in the cars with 4 heaters and at that time Car B (Alcohol) showed 53° top and 45° bottom and Car A a top of 56° and bottom of 44°. This reading was made after nearly 7 hours stay in each cold, in part, to account for the rather wide spread. Upon arrival at Jersey City, the average of all 11 positions was 50.3° for Car A (4 charcoal heaters) 59.7° for Car B (4 alcohol heaters), and 55.2° for Car C (2 alcohol heaters).

There was a rather wide spread between the maximum and minimum temperature in each car upon arrival which is believed due to the long standing period at Lornell when the fans were not operating and the heaters were burning. Eighteen hours after arrival the temperatures were more uniform as shown in Table 4.

Transit air temperatures as recorded by the Ryan thermometers are shown in Figures 3, 4, and 5. The air temperatures rose rapidly every time the cars were stopped and the fans inoperative. The bottom air curves also show the influence of the fans but not to the same degree.

The test boxes from each car were placed in the 65°F ripening room on December 12, and pressure test readings were made daily until the pears were fully ripe (3 to 4 pounds pressure). A summary of pressure tests determined daily on the pears from the test boxes is given in Table 5. Each figure represents an average of thirty tests, three tests on each of ten pears selected at random. The fruit in all test boxes was found to be only a little softer than at the time of loading. There was a slight decrease in pressures by the following day and a marked decrease by the second day and the pears were fully ripe by the third to fourth day after the start of the holding test. Ripening was fairly uniform regardless of the location of the test package in the car. There was little difference in the ripening behavior of the fruit in Car C with two alcohol heaters and that in Car B with four alcohol heaters. The pears from Car A with four charcoal heaters were in almost every instance slightly riper (as evidenced by lower pressure) than those from the other two cars. This is shown by Figure 2 where the average pressure test readings for all boxes of each car are plotted against days in the 65° room. It has been pointed out that commodity temperatures at the time of arrival were practically the same in the two cars with four heaters each and while the cars were on track at Jersey City, and that somewhat lower temperatures occurred in Car C with only two heaters. The differences between the heated cars with respect to firmness of the test fruit as shown by the pressure tests were not very great. While the initial pressure tests taken when boxes were placed in the ripening room (after 2 days heating in transit) were only slightly lower than at time of loading, this is in accord with results obtained in previous tests[2/] which showed that Bosc pears softened slowly the first two days after transfer to the 65° ripening room.

Ripening data (pressure tests) for the one box removed on December 12 from Car D (without heaters) (see Footnote 1) are also shown in Table 5 and Figure 2. At the start of the holding test at 65°F. the fruit from this box was about a pound lower in pressure than at time of shipment. No softening occurred during the first two days in the ripening room. (The 0.2 pound reading obtained after one day may have been due to variation between daily samples). Pressure tests were much lower three days after the box was placed in the holding room and fell rapidly thereafter so that the pears were ripe by the sixth day. A comparison of the ripening (softening) curves in Figure 2 indicates that the effect of the heaters in the three cars was to hasten ripening by about one and a half to two days.

2/ P. T. S. Office Report No. 212, July 1, 1949

Discussion and Conclusions

The results of this test indicate that it is feasible to partially ripen Western-grown winter pears in refrigerator cars during transit by the use of heaters between Chicago and eastern markets such as New York City. Although temperature records are incomplete, they show that the fruit in cars with four heaters attained good ripening temperatures throughout the load by the time of arrival at Jersey City and ripening was hastened by one and a half to two days.

The extent to which ripening might be expected to occur as a result of using heaters would depend upon a number of factors such as, condition of fruit at time of loading, the transit point at which heaters were installed, the time in transit and the length of time between arrival and unloading. Further tests should be conducted to supplement the present information before specific recommendations are made.

Acknowledgements

This test was made possible through the cooperation and assistance of the following:

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W. H. Redit and S. E. Hoelscher, Jr. accompanied the test cars from Chicago to New York.

TABLE 1

HEATER INSPECTION DATA

Test Code No. A — Thermostat Setting Highest (69-74°) — Heater Simplex

Car No. PFE 7378 — Fans on — Drains ____ — Placement 2 each end

Inspected at	Date Dec.	Time	OST	Thermo. Temp. (1)	HEAD END Burner Operations	Gals.~~lbs.~~ fuel added	~~Gals.~~ lbs. fuel in heater	~~Gals.~~ lbs. Fuel consumed from last inspection	
Huntington, Ind.	9	2:00A	16°	35°	Lit	----	Full	----	
Marion, Ohio	9	7:00A	12°	65°	Damp. closed	----	----	----	
Marion, Ohio	9	Noon	27°	64°	Closed	----	----	----	
Kent, Ohio	9	4:30P	29°	60°	Closed	----	----	----	
Meadville, Pa.	9	8:30P	17°	68°	"	----	1/2 full	----	
Hornell, N.Y.	10	2:00A	3°	63°	"	----	1/2 full	----	
Hornell, N.Y.	10	3:30	13°	71°	"	1 bag to each			
Susquenenna, Pa.	10	2:00P	34°	70°	"	----	----	----	
Pt. Jarvis, N.J.	10	6:30P	24°	75°	"	----	----	----	Cut-off closed
Jersey City, N.J.	10	12MN	38°	77°	"	30 lb. estimate			Heaters removed
Jersey City, N. J.	11	9:00A	40°	58°	-----				
					REAR END				
Huntington, Ind.	9	2:00A	16°	38°	Lit	----	Full	----	
Marion, Ohio	9	7:00A	12°	64°	Damp. closed	----	----	----	
Marion, Ohio	9	Noon	27°	68°	Open	----	----	----	
Kent, Ohio	9	4:30P	29°	66°	Closed	----	----	----	
Meadville, Pa.	9	8:30P	17°	70°	"	----	1/2 full	----	
Hornell, N.Y.	10	2:00A	3°	64°	"	3/4 bag			
Hornell, N.Y.	10	3:30A	13°	77°	"	3/4 bag			
Susquenenna, Pa.	10	2:00P	34°	74°	"	----	----	----	
Pt. Jarvis	10	6:30P	24°	78°	"	----	----	----	Cut-off closed
Jersey City, N.J.	10	12MN	38°	80°	"	---	----	----	Heaters removed
Jersey City, N.J.	10	9:00A	40°	60°	----	----			

(1) Air temperature in bunker at level of thermostat

Table 2

HEATER INSPECTION DATA

Test Code No. B Thermostat Setting 60° Heater Proc
Car No. PFE 7128 Fans on Drains Placement 2 each end

Inspected at	Date Dec.	Time	DST	Thermo. Temp. (1)	HEAD END Burner Operation #3 #4	Gals. fuel added #3 #4	Gals. fuel in heater #3 #4	Fuel consumed since last inspection #3 #4	
Huntington, Ind.	9	2A	1c°	32°	FB FB	——	5.1 5.1	——	
Marion, Ohio	9	7A CST	12°	42°	" "	——	——	——	
Marion, Ohio	9	Noon	27°	45°	" "	——	——	——	
Kent, Ohio	9	4:30	29°	49°	" "	——	——	——	
Meadville, Pa	9	6:30	17°	60°	" "	——	3.0 3.05	1.5 1.55	
Cornell, N.Y.	10	2A	3°	53°	" "	——	——	——	
Cornell, N.Y.	10	6:30A	13°	51°	" "				
Susquehenna, Pa.	10	2P	34°	57°	P FB	——	——		
Mt. Jarvis, N.J.	10	6:30P	24°	55°	P Pre-out	FB —	——		
Jersey City, N.J.	10	12AN	36°	57°	F F	——	1.5 1.25	2.1 2.3	Heaters extinguished
Jersey City, N.J.	11	9A	40°	54°	——	——			Heaters removed
					Total fuel used			3.6 3.85	

					HEAD END #5 #6	#5 #6	#5 #6	#5 #6	
Huntington, Ind.	9	2A	1c°	32°	FB FB	——	5.05 5.2	——	
Marion, Ohio	9	7A CST	12°	42°	FB FB	——	——	——	
Marion, Ohio	9	Noon	27°	47°	" "	——	——	——	
Kent, Ohio	9	4:30	29°	51°	" "	——	——	——	
Meadville, Pa.	9	6:30P	17°	52°	" "	——	3.5 3.6	1.55 1.6	
Cornell, N.Y.	10	2A	3°	44°	" "	——	——	——	
Cornell, N.Y.	10	6:30A	13°	54°	" "	——	——	——	
Susquehanna, Pa.	10	2P	34°	57°	" "	——	——	——	
Mt. Jarvis, N.J.	10	6:30P	24°	54°	P P	——	——	——	
Jersey City	10	12AN	36°	58°	F F	——	.95 1.1	2.55 2.4	Heaters extinguished
Jersey City	11	9A	40°	54°					Heater removed
					Total fuel			4.10 4.10	

(1) Air temperature in bunker at level of thermostat.

TABLE 3

HEATER INSPECTION DATA

Test Code No. C Thermostat Seting 60° Heater Preco #1Head #2Rear
Car No. PFE 5577 Fans On Drains ____ Placement 1 ea. end

Inspected at	Date Dec.	Time	OST	Thermo. Temp. (1) H	Thermo. Temp. (1) R	Burner Operation Lit H	Burner Operation Lit R	Gals. fuel added H	Gals. fuel added R	Gals. fuel in heater H	Gals. fuel in heater R	Fuel consumed from last inspection H	Fuel consumed from last inspection R	
Huntington, Ind.	9	2:00A	16°	35°	35°	FB	FB	---		5.05	4.95	----------		
Marion, Ohio	9	7:00A	12°	42°	42°	FB	FB	---		-----		----------		
Marion, Ohio	9	noon	27°	44°	44°	FB	FB	---		-----		----------		
Kent, Ohio	9	4:30P	29°	46°	47°	FB	FB	---		-----		----------		
Meadville, Pa.	9	8:30P	17°	46°	47°	FB	FB	---		3.65	3.20	1.40	1.75	
Hornell, N.Y.	10	2:00A	3°	47°	48°	FB	FB	---		-----		----------		
Hornell, N.Y.	10	8:30A	13°	47°	46°	FB	FB	---		-----		----------		
Susquehenna, Pa.	10	2:00P	34°	51°	50°	FB	FB	---		-----		----------		
Pt. Jarvis, N.J.	10	6:30P	24°	52°	53°	FB	FB	---		-----		----------		
Jersey City, N.J.	10	12MN	33°	54°	53°	P	FB	---		.65	.45	3.00	2.75	Heaters extinguished
Jersey City, N.J.	11	9:00A	40°	50°	50°			---		-----		----------		Heaters removed
										Total fuel		4.40	4.50	

(1) Air temperature in bunker at level of thermostat.

TABLE 4

COMMODITY Pears — CORRECTED AIR AND COMMODITY TEMPERATURES

STATION	DATE Dec.	TIME	OST	12 Top Air	1 BQCL Center	3 MQCL Center	5 TQCL Center	10 MQNS Center	2 BQCL Edge	4 MQCL Edge	6 TQCL Edge	11 MQNS Edge	7 BDNS Center	8 TDCL Center	9 TDNS Center	MAX	MIN	Ave. QUARTER Length	Ave. CAR
Car No. 7878 4 Simplex Charcoals - 2 each end																			
Huntington, Ind.	8	4-6P	23°									(7 readings only)[1/]				42.0	40.0	----	40°
Jersey Cit , N.J.	10	MN	38°	730	530	565	625	570	570	635	700	645	590	625	600	70.0	53.0	60.5	60.5
Jersey City, N.J.	11	9:00A	40°	650	555	590	645	595	550	610	670	610	605	650	630	67.0	55.0	60.3	61.0
New York, N.Y.	11	6:00P	47°	620	565	595	655	600	540	600	665	600	595	655	640	66.5	54.0	60.3	61.0
Car No. PFE 7328 4 Precos - 2 each end																			
Huntington, Ind.	8	4-6P	23°									(6 readings only)[1/]				40.0	36.0		38°
Jersey City, N.J.	10	MN	38°	690	575	570	605	575	665	630	655	605	520	590	590	66.5	52.0	60.8	59.6
Jersey City, N.J.	11	9:00A	40°	615	580	590	625	575	625	600	630	580	550	610	605	63.0	55.0	60.1	59.7
New York, N.Y.	11	6:00P	47°	605	580	595	630	585	635	590	625	575	550	615	605	63.5	55.0	60.2	59.8
Car No. PFE 5577 2 Precos - 1 each end																			
Huntington, Ind.	8	4-6P	23°									(6 readings only)[1/]				41.0	40.0		40°
Jersey City, N.J.	10	MN	38°	680	500	510	520	525	580	670	57[illegible]	565	---	535	540	67.0	50.0	55.6	55.2
Jersey City, N.J.	11	9:00A	40°	560	520	530	540	545	570	605	5[illegible]	540	---	555	560	60.5	52.0	55.2	55.3
New York, N.Y.	11	6:00P	47°	550	530	535	550	550	565	575	560	535	---	550	565	57.5	53.0	55.0	55.3

All cars unloaded 7-10 PM December 10

[1/] Temperatures obtained by hand fruit thermometers when fruit pressure-tested.

U.S.D.A.

Table 3 - Summary of ripening of pears in test boxes held at 65°F.

Car	Heaters used	Position of test boxes	Pressure test (in pounds) at specified daily interims				
			12/13/49 Start	12/13/49 1 day	12/14/49 2 days	12/15/49 3 days	12/16/49 4 days
A	4 Simplex	TCLCL	10.2	7.2	4.3	3.3	3-
		MCLCL	1 .7	8.5	5.1	3.4	3.9
		BCLCL	1 .7	9.0	4.7	3.0	3.5
		BDHS	[illegible]	9.5	5.3	4.0	3.9
		Average	1 .2	8.7	4.9	3.4	3.9
B	4 Preco	TCLCL	11.2	[illegible]	4.7	3.6	3-
		MCLCL	12.1	[illegible]	6.2	4.1	3.6
		BCLCL	11.2	1 .7	6.3	3.3	3.0
		BDHS	11.5	[illegible]	6.3	5.0	3.7
		Average	11.2	9.5	6.0	4.1	3.5
C	2 Preco	TCLCL	11.1	1 .3	[illegible]	4.5	3.9
		MCLCL	10.5	1 .3	[illegible]	4.5	4.2
		BCLCL	10.4	10.0	[illegible]	5.1	4.2
		BDHS	11.1	[illegible]	[illegible]	5.2	4.2
		Average	10.[illegible]	10.0	5.9	4.9	4.1
Check 1/	None	TDHS	10.4	9.2	10.3	7.5	5.3 2/

1/ See text Footnote 1 for details regarding this car.

2/ Pressure test readings were 4.9 pounds on 5th day, 3.9 on 6th day and 3.0 on 7th day.

FIGURE 1

OUTSIDE AIR TEMPERATURE

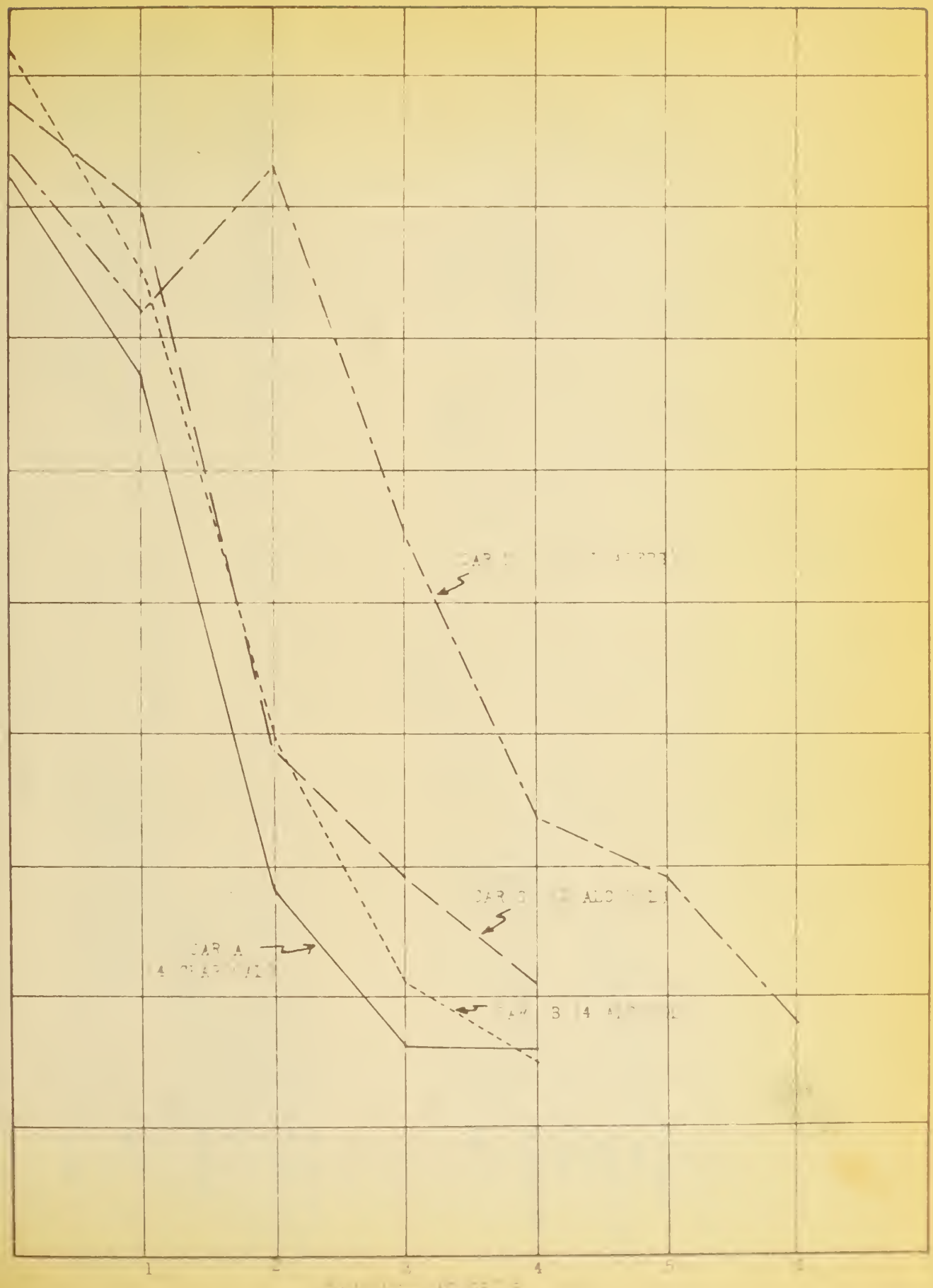
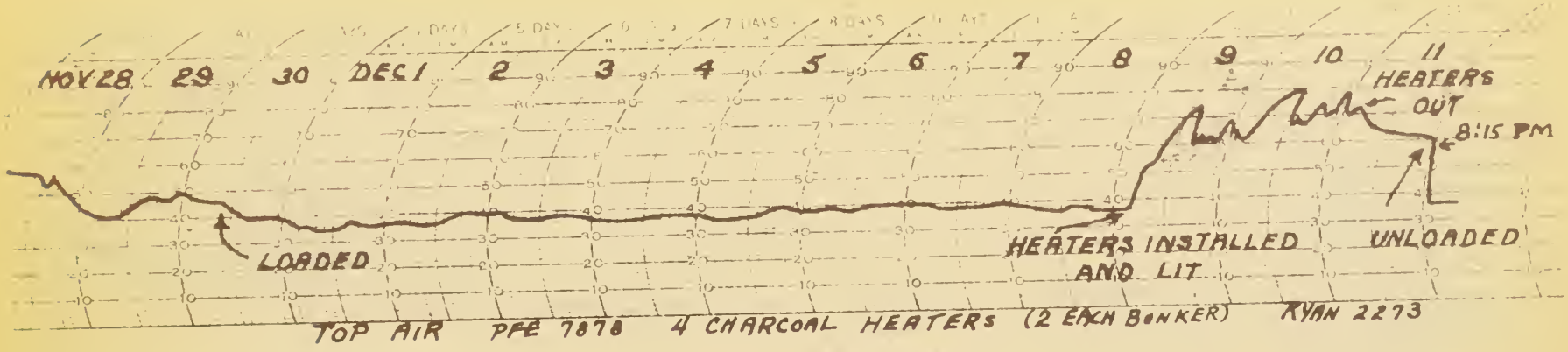
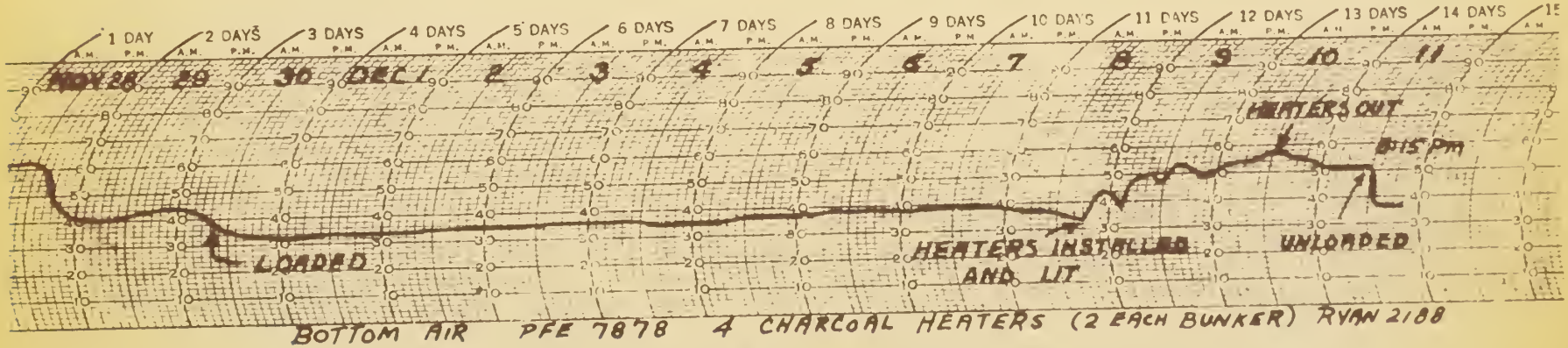


FIG 3
TRANSIT AIR TEMPERATURES
CAR A
4 CHARCOAL HEATERS (2 EACH BUNKER)

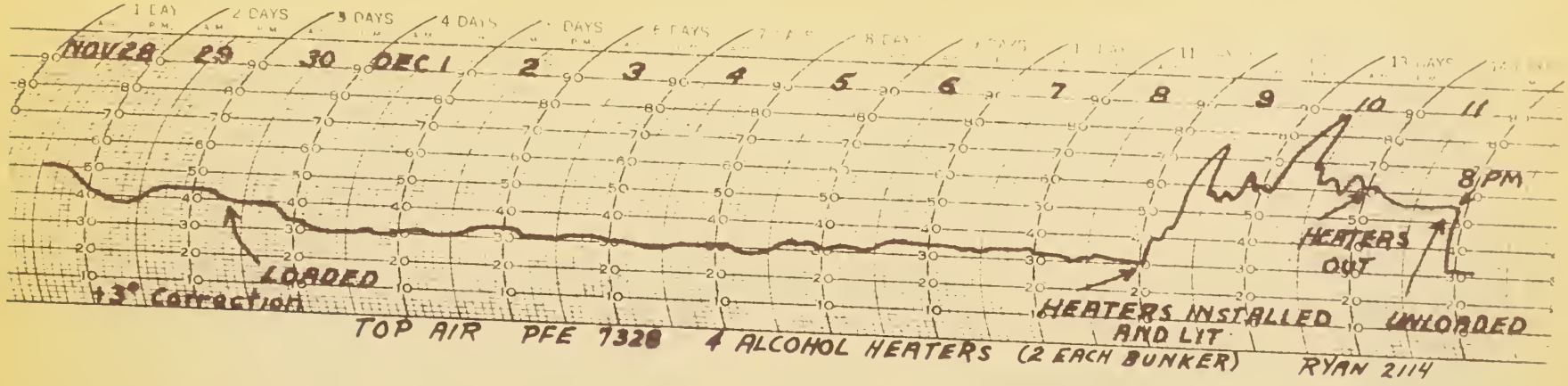


TOP AIR TEMPERATURES

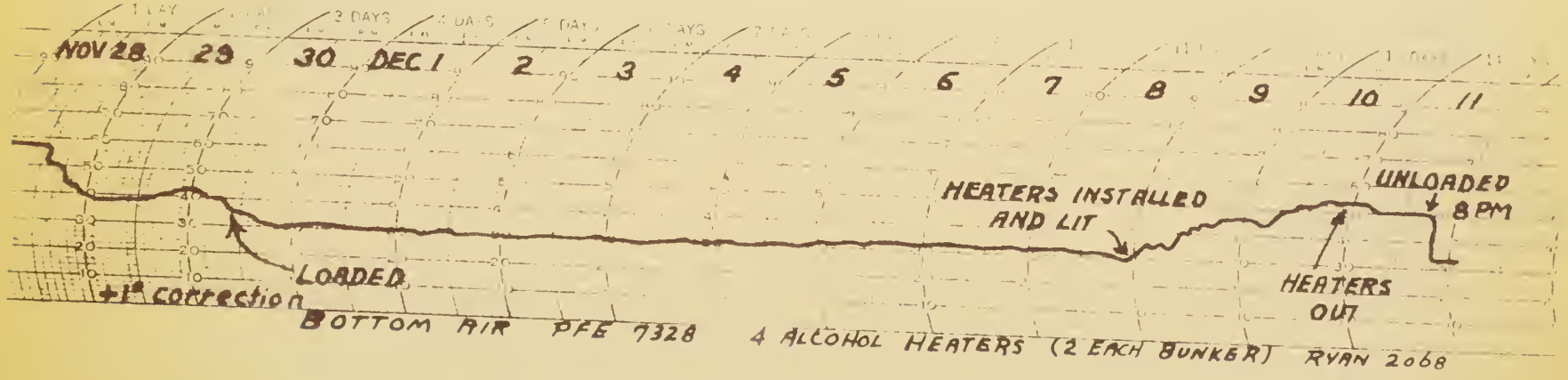


BOTTOM AIR TEMPERATURES

FIG 4
TRANSIT AIR TEMPERATURES
CAR B
4 ALCOHOL HEATERS (2 EACH BUNKER)

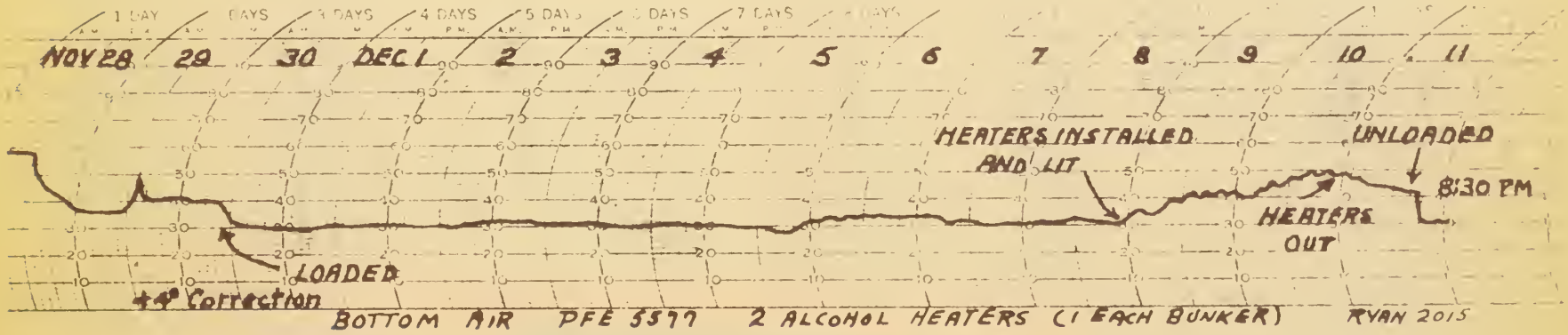


TOP AIR TEMPERATURES



BOTTOM AIR TEMPERATURES

FIG 5
TRANSIT AIR TEMPERATURES
CAR C
2 ALCOHOL HEATERS (1 EACH BUNKER)



BOTTOM AIR TEMPERATURES

NOTE- Top temperatures not obtained due to instrument failure.